# Practical and ethical challenges of large language models in education: A systematic scoping review

Year: 2023 | Citations: 452 | Authors: Lixiang Yan, Lele Sha, Linxuan Zhao, Yuheng Li, Roberto Martínez Maldonado

## Abstract

Educational technology innovations leveraging large language models (LLMs) have shown the potential to automate the laborious process of generating and analysing textual content. While various innovations have been developed to automate a range of educational tasks (eg, question generation, feedback provision, and essay grading), there are concerns regarding the practicality and ethicality of these innovations. Such concerns may hinder future research and the adoption of LLMs■based innovations in authentic educational contexts. To address this, we conducted a systematic scoping review of 118 peer■reviewed papers published since 2017 to pinpoint the current state of research on using LLMs to automate and support educational tasks. The findings revealed 53 use cases for LLMs in automating education tasks, categorised into nine main categories: profiling/labelling, detection, grading, teaching support, prediction, knowledge representation, feedback, content generation, and recommendation. Additionally, we also identified several practical and ethical challenges, including low technological readiness, lack of replicability and transparency and insufficient privacy and beneficence considerations. The findings were summarised into three recommendations for future studies, including updating existing innovations with state■of■the■art models (eg, GPT■3/4), embracing the initiative of open■sourcing models/systems, and adopting a human■centred approach throughout the developmental process. As the intersection of AI and education is continuously evolving, the findings of this study can serve as an essential reference point for researchers, allowing them to leverage the strengths, learn from the limitations, and uncover potential research opportunities enabled by ChatGPT and other generative AI models.

What is currently known about this topic

Generating and analysing text■based content are time■consuming and laborious tasks.

Large language models are capable of efficiently analysing an unprecedented amount of textual content and completing complex natural language processing and generation tasks.

Large language models have been increasingly used to develop educational technologies that aim to automate the generation and analysis of textual content, such as automated question generation and essay scoring.

What this paper adds

A comprehensive list of different educational tasks that could potentially benefit from LLMs■based innovations through automation.

A structured assessment of the practicality and ethicality of existing LLMs■based innovations from seven important aspects using established frameworks.

Three recommendations that could potentially support future studies to develop LLMs■based innovations that are practical and ethical to implement in authentic educational contexts.

Implications for practice and/or policy

Updating existing innovations with state■of■the■art models may further reduce the amount of manual effort required for adapting existing models to different educational tasks.

The reporting standards of empirical research that aims to develop educational technologies using large language models need to be improved.

Adopting a human■centred approach throughout the developmental process could contribute to resolving the practical and ethical challenges of large language models in education.